

REMARKS

Applicant respectfully requests reconsideration of this application. Claims 1, 3-10, and 31-37 are pending. No claims have been amended, cancelled, or added. Therefore, claims 1, 3-10, and 31-37 are now presented for examination.

Current Status of Application

This application was the subject of an appeal, the appeal brief being filed on July 15, 2005. It is presumed that the current Office Action is the result of the prosecution of this application being reopened after appeal, although the Office Action does not state this.

Because there are new references cited in this Office Action that have not yet been addressed, the Applicant has chosen to file a response to the non-final action before again pursuing the appeal in this matter.

New References

It is respectfully submitted that the new references suffer from similar deficiencies as the previously cited references. These references do not address the elements of the claims.

Claim 1 reads as follows:

1. A microelectronic device comprising:
a die, the die comprising a first side, a second side, and an edge;
a first plate, the first plate coupled with the die, the first plate exerting force on the die to modify the effective coefficient of thermal expansion of the die; and
a package, the die being coupled with the package.

Once again, this claim includes a first plate, with “the first plate exerting force on the die to modify the effective coefficient of thermal expansion of the die”. It is respectfully submitted that the references are irrelevant to the claim because none relate to exerting physical force on the die to modify the effective coefficient of thermal expansion. References to thermal conduction are NOT relevant – these references deal with the removal of heat, and not a physical force to modify the coefficient of thermal expansion (CTE). References to apparatus to allow thermal expansion and contraction are NOT relevant – these references deal with accommodating thermal expansion, and not a physical force to modify the CTE.

To address the cited references in turn:

Claim Rejection under 35 U.S.C. §102

Little

The Examiner rejected claims 1 and 6 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,663,596 of Little. (“Little”).

Little presents an integrated circuit that includes spring contacts, as shown in the figures. The use of the spring contacts does address thermal expansion, but in a completely different way. Rather than modify the coefficient of thermal expansion, the spring contacts allow for expansion, a completely different concept.

As indicated in Little, “[i]n a second feature of the spring contacts, their resilience accommodates thermal expansion stresses caused by differential temperature coefficients between a chip and a substrate (as in FIG. 5).” (Little, col. 9, line 66 through col. 10, line 2)

Rather than address thermal expansion, Little has provided an apparatus for allowing the expansion to occur uninhibited. Thus, Little has chosen a different approach to addressing thermal issues, and this reference has no relation to the elements of the claims that are at issue here. Little does not address modification of a coefficient of thermal expansion.

Claim 6 is dependent on claim 1, and is thus allowable as being dependent on the allowable base claim.

Claim Rejection under 35 U.S.C. §102

Horvath

The Examiner rejected claim 1 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,415,025 of Horvath (“Horvath”).

Horvath addresses a thermal conduction element for semiconductor devices. As shown in Figure 1, the element is a disk shaped thermal bridge that is intended to conduct from a device to a cold plate.

As stated in Horvath, the claimed invention is a conduction element for cooling semiconductors. “The invention is an improved cooling element adapted to be positioned between a solder bonded semiconductor device and a module cap or cold plate to form a heat conduction bridge between the device and the cap or cold plate.” (Horvath, col., 2, lines 38-40)

Thus rather than address a physical force to thermal expansion, Horvath has provided an apparatus for conducting heat away from a semiconductor device. Thus, Horvath has also chosen a very different approach to addressing thermal expansion, and this reference has no relation to the elements of the claims that are at issue here.

Conducting heat away simply cools a device – it does not modify its coefficient of thermal expansion. Thus, Horvath does not address modification of a coefficient of thermal expansion.

Claim Rejection under 35 U.S.C. §102

Turner

The Examiner rejected claim 1 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application No. 2002/0185728 of Turner (“Turner”).

Turner addresses a thermal transfer plate for coupling a thermal hardware element to an integrated circuit package. The plate presented in Turner is of a particular design that may be mounted in such a way as to address tolerance issues. Each footpad includes a spring zone 36 and a standoff member 40. As described in Turner, the standoff members and footpads are connected to the plate via the spring zones, which permit depression of the footpads towards the substrate during installation. (Turner, ¶0017) The intent of the design is to provide that force caused by, for example, dropping the product is transferred to the substrate without disturbing the position of the plate. Further, the design is intended to compensate for tolerance variations. (Turner, ¶0018)

Thus, rather than address a physical force to thermal expansion, Turner has provided an apparatus for attaching a thermal plate, which then would conduct heat away from a device. In this case, Turner is not actually concerned with thermal expansion at all. Rather, Turner is concerned with a method of attaching a thermal plate in a spring-loaded fashion that will withstand dropping and reduce tolerance issues. Thus, Turner does not address modification of a coefficient of thermal expansion.

Claim Rejection under 35 U.S.C. §102

Huang, et al.

The Examiner rejected claim 1 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application No. 2004/0052054 of Huang, et al. (“Huang”).

Huang presents a heat dissipating assembly. As shown in Figure 3, the assembly includes an abutting plate 301, which has been cited by the Examiner. However, the description indicates a very different purpose than indicated by the Examiner.

In Figure 3, Huang indicates that the engaging posts 22 of the second engaging unit engage the notches 3224 in the lower plate portions 3222 at the same time that the resilient lateral plates 302 deform to generate a downward restoring force acting on the abutting plate 301 to bias the heat transfer plate toward the electronic component 5. As indicated in Huang, this is done such that heat conductive contact between the heat transfer plate and the electronic component can be ensured. (Huang, ¶0037) Huang then goes on to state that the restoring force acting on the abutting plate 301 is evenly applied to the die portion 51 of the electronic component 5 so as to prevent damage at the edges of the electronic component 5.

Once again, Huang addresses a different solution to thermal issues. What Huang is doing is to describe a heat conduction element that has some restoring force caused by deformation of elements to push the plate against the electronic element. Thus, any force described is used to ensure a contact between elements, but is NOT in any way related to modifying a coefficient of thermal expansion. Any thermal expansion is unchanged by the apparatus described by Huang. Huang may accommodate thermal expansion, but it does not change it.

Claim Rejection under 35 U.S.C. §103

Little, Horvath, Turner, and Huang in view of Zhang, et al.

The Examiner rejected claims 3 and 7-10 under 35 U.S.C. 103 (a) as being unpatentable over Little, Horvath, Turner, and Huang in view of U.S. Patent Publication 2002/0171144 of Zhang, et al. ("Zhang").

As has been shown above, Little, Horvath, Turner, and Huang are not relevant to the claims. Claims 3 and 7-10 are dependent claims and are allowable as being dependent on the allowable base claim.

In addition, as has already been discussed in a prior response, Zhang is not relevant to the claims. Zhang does not provide for a plate exerting forces on a die to modify its effective CTE. Zhang describes a grid array package with a heat spreader. (Zhang, e.g. ¶0002) The heat spreader is intended to improve the thermal and electrical performance of a package. (Zhang, ¶¶0013, 0053) As was previously stated in the prior response, Zhang is concerned with thermal and electrical performance, not with affecting the CTE of the die.

As has also been explained previously, Zhang mentions CTE in paragraph 0065, but in a completely different context:

[0065] In an embodiment, stiffener or ring 502 is attached to the top surface of substrate 104. Ring 502 may be attached to substrate 104 by a laminate or adhesive 510. Encapsulant 116 is filled in and flushed to ring 502 after the attachment of ring 502. Ring 502 is preferably made of a metal, such as copper or aluminum, or a combination thereof, but may also be constructed from other applicable materials. *Preferably, ring 502 is made from the same material as heat spreader 504, to minimize the mismatch of the thermal expansion coefficients.* Ring 502 is preferably

flush with the outer edges of substrate 104 to form an outer edge of the BGA package, but may also reside entirely within or partially outside an outer profile of substrate 104.

(emphasis added) Zhang is indicating that a ring 502 may be attached to the top surface of the substrate, and that it is preferable to match the CTE of the ring and the heat spreader. Therefore, Zhang is only suggesting that the CTE values of these structures that are added to the die should match. The provisions in Zhang have no relevance to the CTE of the die.

Therefore, Little, Horvath, Turner, Huang, and Zhang, alone or in any combination, do not teach or suggest the elements of the claims.

Conclusion

Applicant respectfully submits that the rejections have been overcome by the foregoing remarks, and that the claims thus are in condition for allowance. Accordingly, Applicant respectfully requests the rejections be withdrawn and the claims be allowed.



Invitation for a Telephone Interview

The Examiner is requested to call the undersigned at (303) 740-1980 if there remains any issue with allowance of the case.

Request for an Extension of Time

The Applicant respectfully petitions for a one-month extension of time to respond to the outstanding Office Action pursuant to 37 C.F.R. § 1.136(a). A check for the necessary fee under 37 C.F.R. § 1.17 is provided herewith.

Charge our Deposit Account

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 3/2/06

Mark C. Van Ness
Reg. No. 39,865

12400 Wilshire Boulevard
7th Floor
Los Angeles, California 90025-1030
(303) 740-1980